FABRICATION AND CHARACTERIZATION OF HIGHLY EFFICIENT DYE-SENSITIZED SOLAR CELL WITH COMPOSITED DYES

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As a representative of the next-generation solar cells, dye-sensitized solar cells (DSSCs) offer the efficient and ease of implementation of new technology for future energy supply. Herein, four commercially available dyes including, curcumin, betanin, crystal violet, methylene blue, their compositions, and two naturally extracted dyes were used as sensitizers for fabrication of titanium oxide photo-anode based DSSCs. All dyes were fully characterized using absorption and emission spectroscopy. Both DFT and TDDFT studies were also carried out to probe the electronic structure of these dyes. The power conversion efficiencies of each DSSCs prepared using the individual and composited dyes were measured and compared. Particularly, this is the first study to combine four different dyes for DSSCs, leading to a remarkable increase of power conversion efficiency. The DSSCs with combined curcumin, betanin, crystal violet, and methylene blue (in 1:1:1:1 respectively) in ethanol exhibited the highest power conversion efficiency of 3.62%.